FRACTURES OF ZYGOMATICOMAXILLARY COMPLEX

Introduction

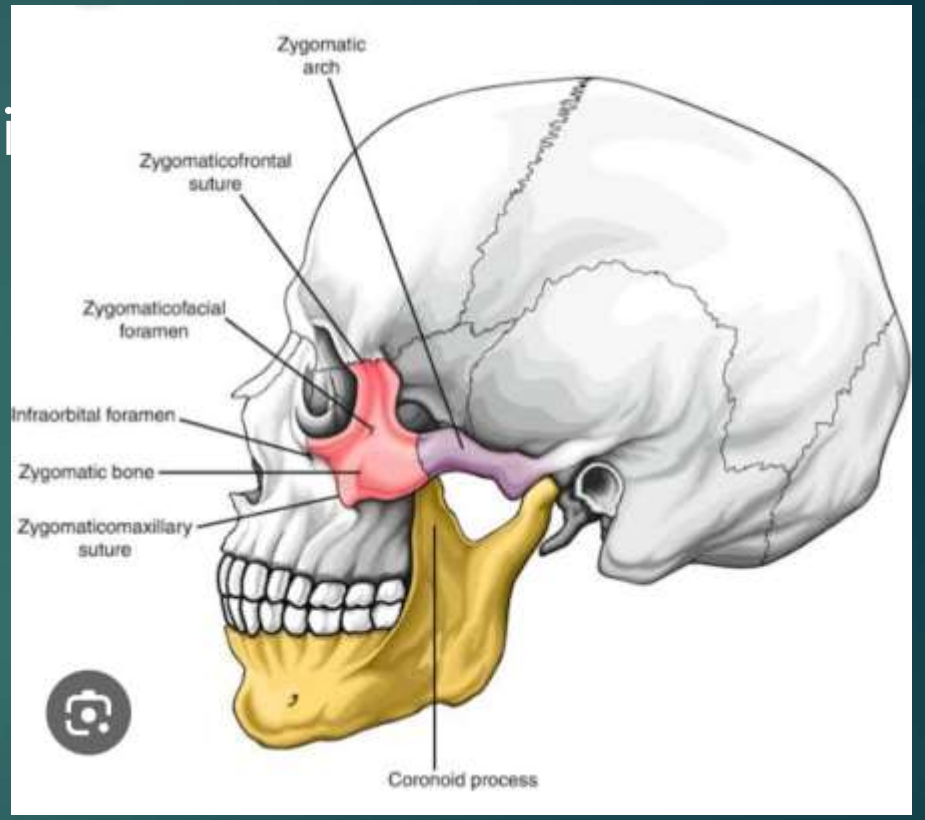
- Zygomaticomaxillary complex plays a key role the structure, function and esthetics of the faci region.

1. It provides lateral or anteroposterior facial projection/ facial width and normal cheek prominence

2. It protects the globe of the eye and separates orbital contents from the temporal fossa and maxillary sinus.

3. Forms the lateral part of the orbit

4. Absorbs impact forces before it reaches brain.



- Zygomatic bone is closely associated with the maxilla,

frontal,

temporal,

sphenoid bones

and they are usually involved when zygomatic bone fracture occurs,

Therefore, these fractures are referred to as ZYGOMATICOMAXILLARY COMPLEX fractures.

Anatomy

- Zygomatic bones are 2 quadrilateral bones present in upper and lateral part of the face.
- Zygomatic bone articulates with 4 bones:

1. Frontal bone
2. Sphenoid bone
3. Maxillary bone
4. Temporal bone

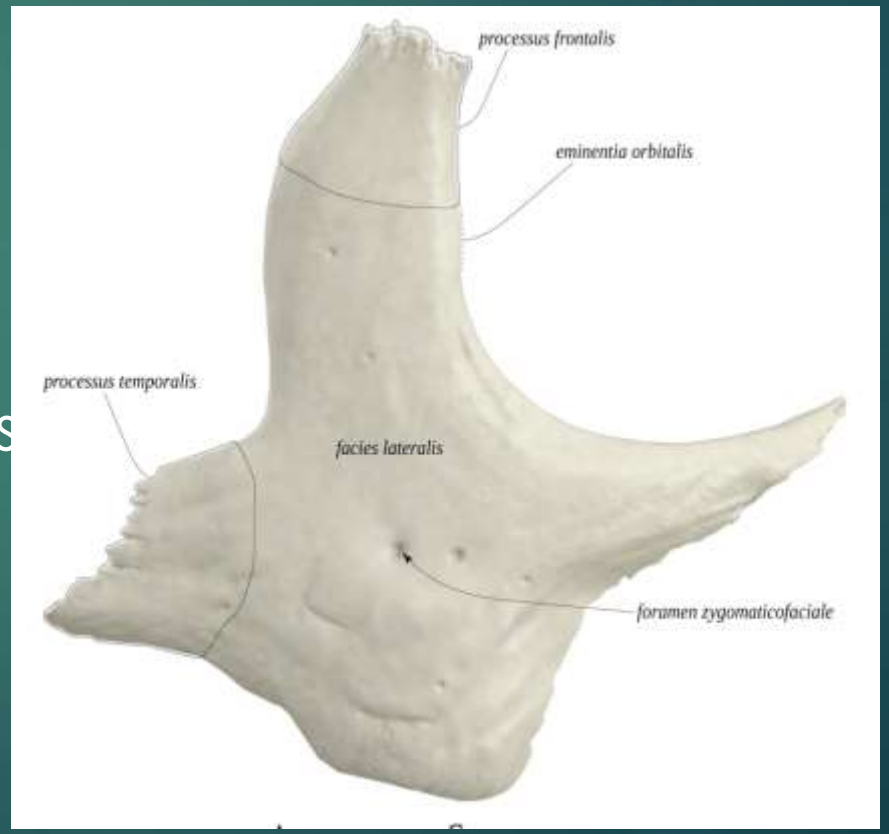
Zygomatic bone has 4 processes

Frontal process

Sphenoid process

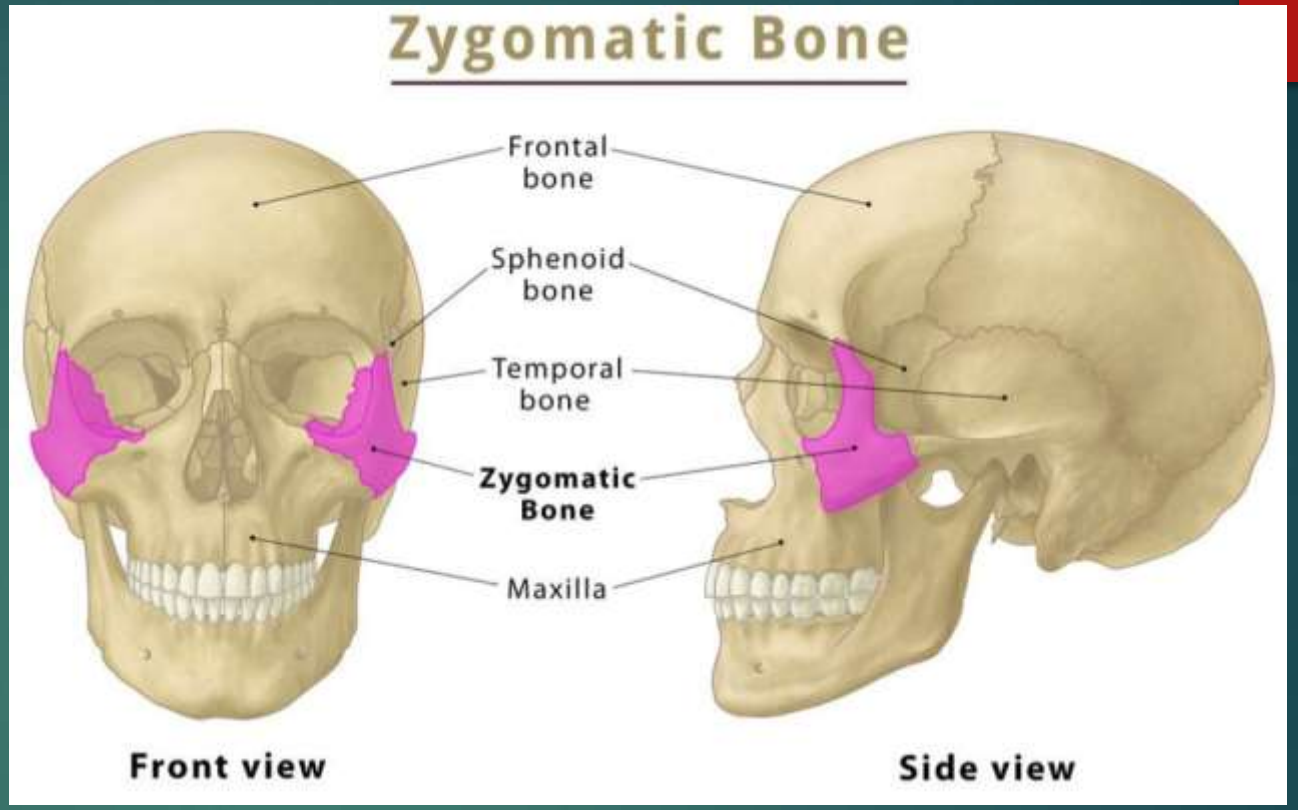
Maxillary process

Temporal process



- Surfaces:

1. Lateral surface
2. Temporal surface
3. Orbital surface



- Foramina:

1. Zygomaticofacial foramen (exit of zygomaticofacial nerves and vessels)
2. Zygomaticotemporal foramen (exit of zygomaticotemporal nerves and vessels)

- Muscle attachments:

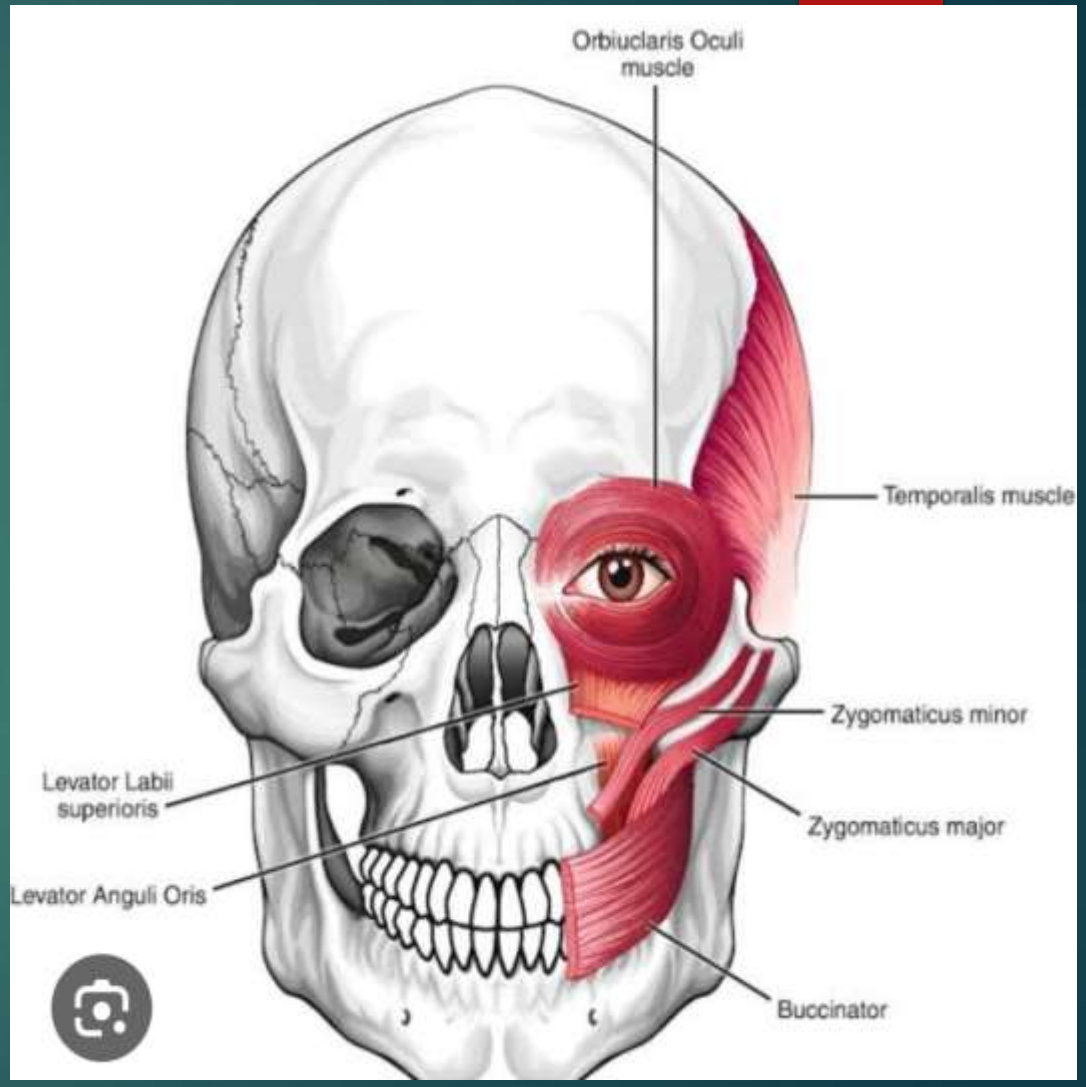
1.masseter

2. Zygomaticus major

3. Zygomaticus minor

4 Levator labii superioris

.5. Temporalis muscle and temporal fascia attach at temporal process.



Etiology

- Direct impact/ blows RTA
- Interpersonal violence
- Falls
- Associated ophthalmic injuries

Left zygoma is affected most

Bilateral zygoma fracture is rare

Male predilection (M:F 4:1)

ZMC fractures: Types

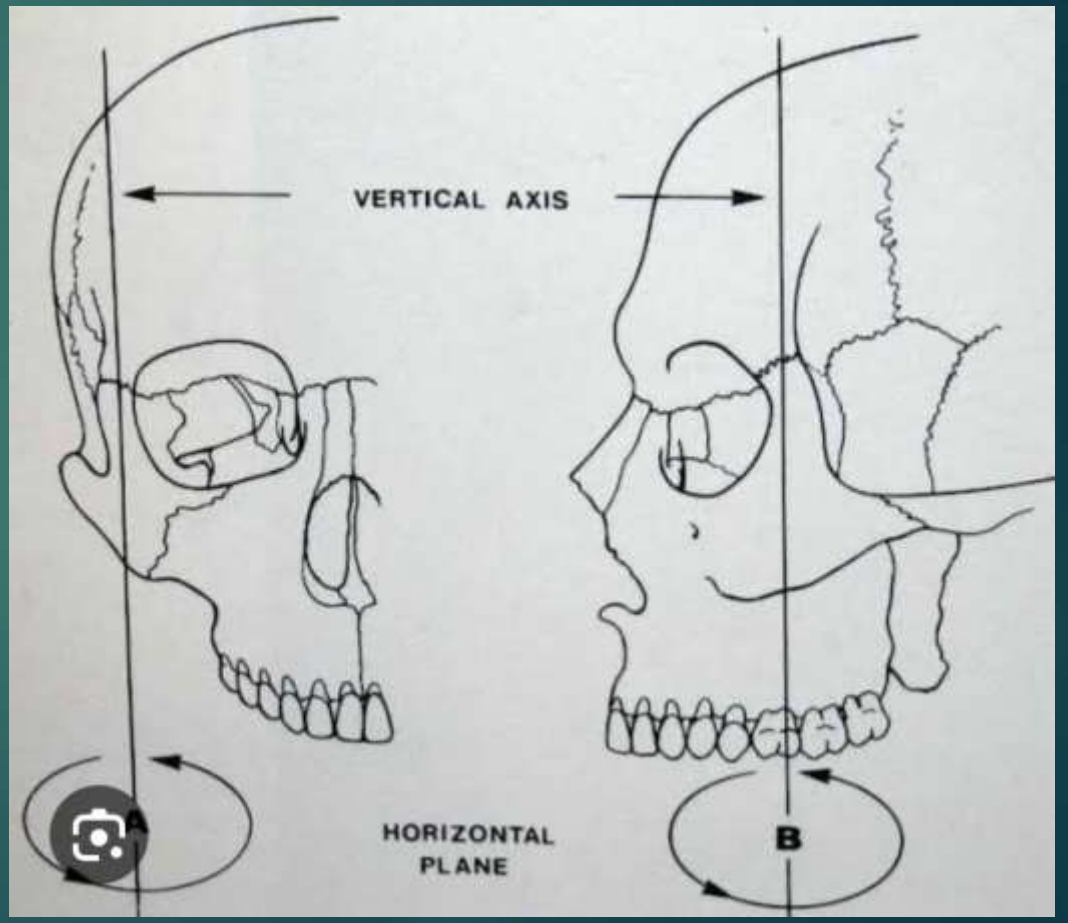
- TRIPOD OR TRIMALAR ZMC FRACTURES
- Because 3 suture lines are disrupted.
- 1. Zygomaticomaxillary, zygomaticosphenoid
- 2. Zygomaticotemporal
- 3. Frontozygomatic

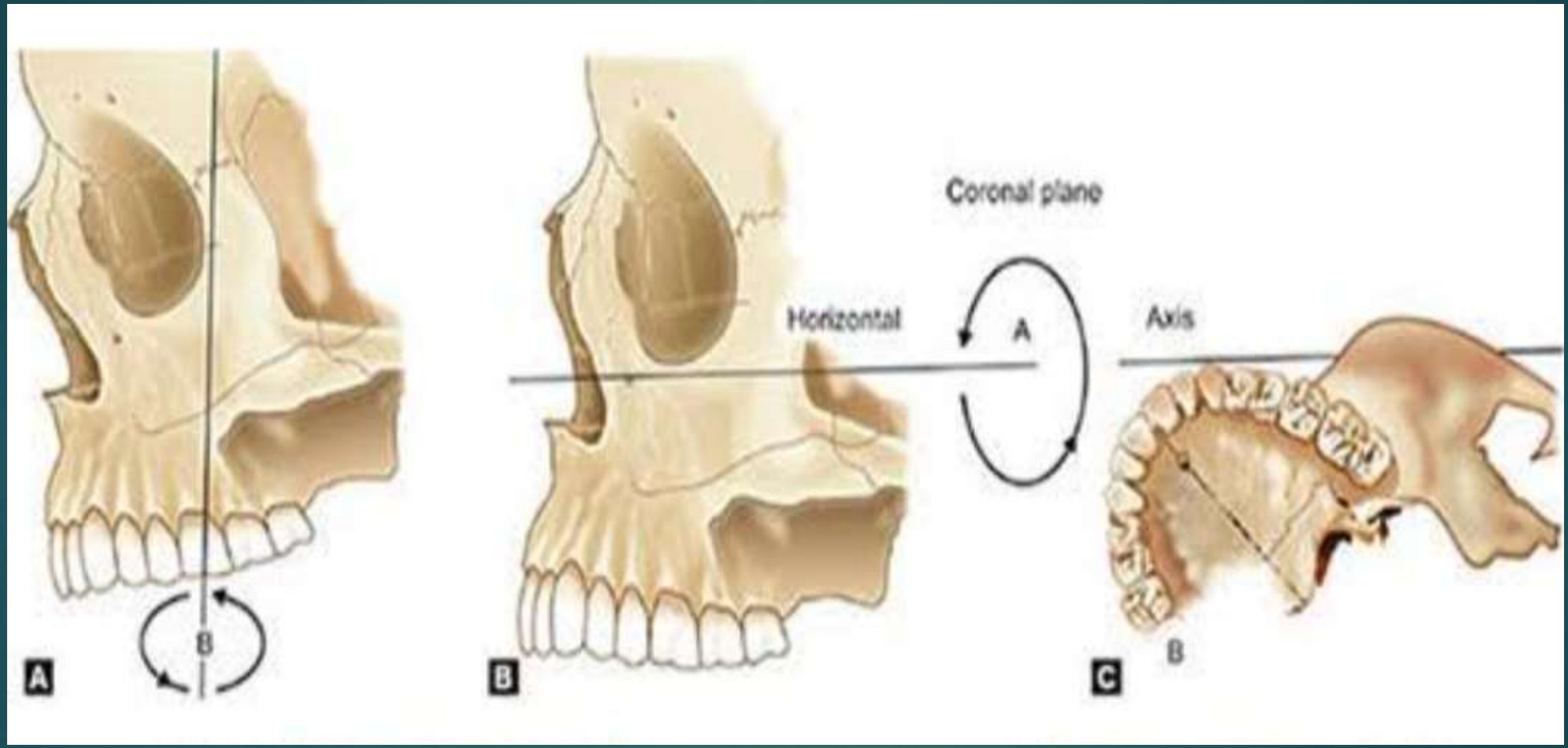
- QUADRIPOD OR QUADRIMALAR FRACTURES
- If Zygomaticomaxillary, zygomaticosphenoid sutures considered separately then it is called as Quadripod or quadrimalar fractures (more accurate description)

- PENTAPOD FRACTURES:
- When Along with 4 mentioned sutures, “inferior orbital rim” is also fractured, then it is described as pentapod fracture.

Classifications

- 1. **Rowe and Killey classification (1968)**
- (based on rotation along the axis)
- Type I: no significant displacement
- Type II: Fractures of the zygomatic arch
- Type III: rotation around the vertical Axis
- Type IV: Rotation around the longitudinal axis
- Type V: Displacement of complex en bloc
- Type VI: Displacement of orbitoantral partition
- Type VII: Displacement of orbital rim segments
- Type VIII: Complex comminuted fractures




A
B
B
Coronal plane
Horizontal
A
C
Axis
B

- ***Rowe's modified classification (1985)***
- (based on stability)

- Group A : Stable fractures
- (Showing minimal or no displacement and requires no intervention)

- Group B: Unstable fractures
- (With great displacement and disruption at the frontozygomatic suture and comminuted fractures

- Group C: Stable fractures
- (Other types of zygomatic fractures which require reduction but no fixation)

- Manson et al classification (1990)
- Based on pattern of segmentation and displacement of ZMC and also based on 3D CT scan correlated with mechanism of energy directed and related to surgical exposure and fixation

- Low energy fracture (18%): incomplete fractures with or without displacement. ZF suture unaffected. No reduction is required. Inherently stable fracture

- Medium energy fracture (77%): complete fractures of all articulations with mild to moderate displacement. Comminution may be present. ORIF sshould be done.

- High energy fractures (5%) : comminution in lateral orbit and extensive posterior and lateral displacement with segmentations of zygomatic arch, associated with pan facial or LeFort fractures.

Signs and syptoms

- Flattening or loss of contour of the injured cheek (possibly masked by swelling)- best seen by viewing the patient from above by standing behind.

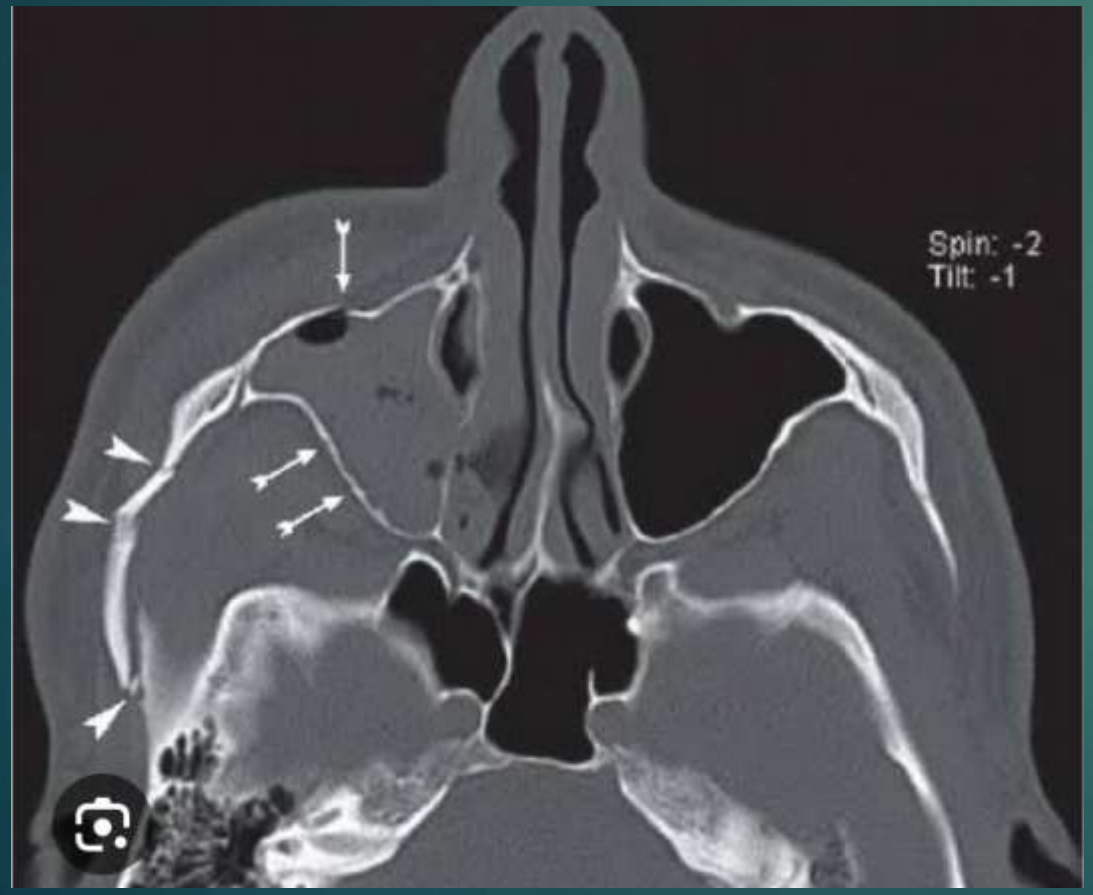
- Unilateral epistaxis
- Circumorbital ecchymosis (develop after few hours)
- Subconjunctival hemorrhage- at other canthus if patient is asked to look medially
- Depression of the occular level
- Propose of the eye (due to retrobulbar hemorrhage)

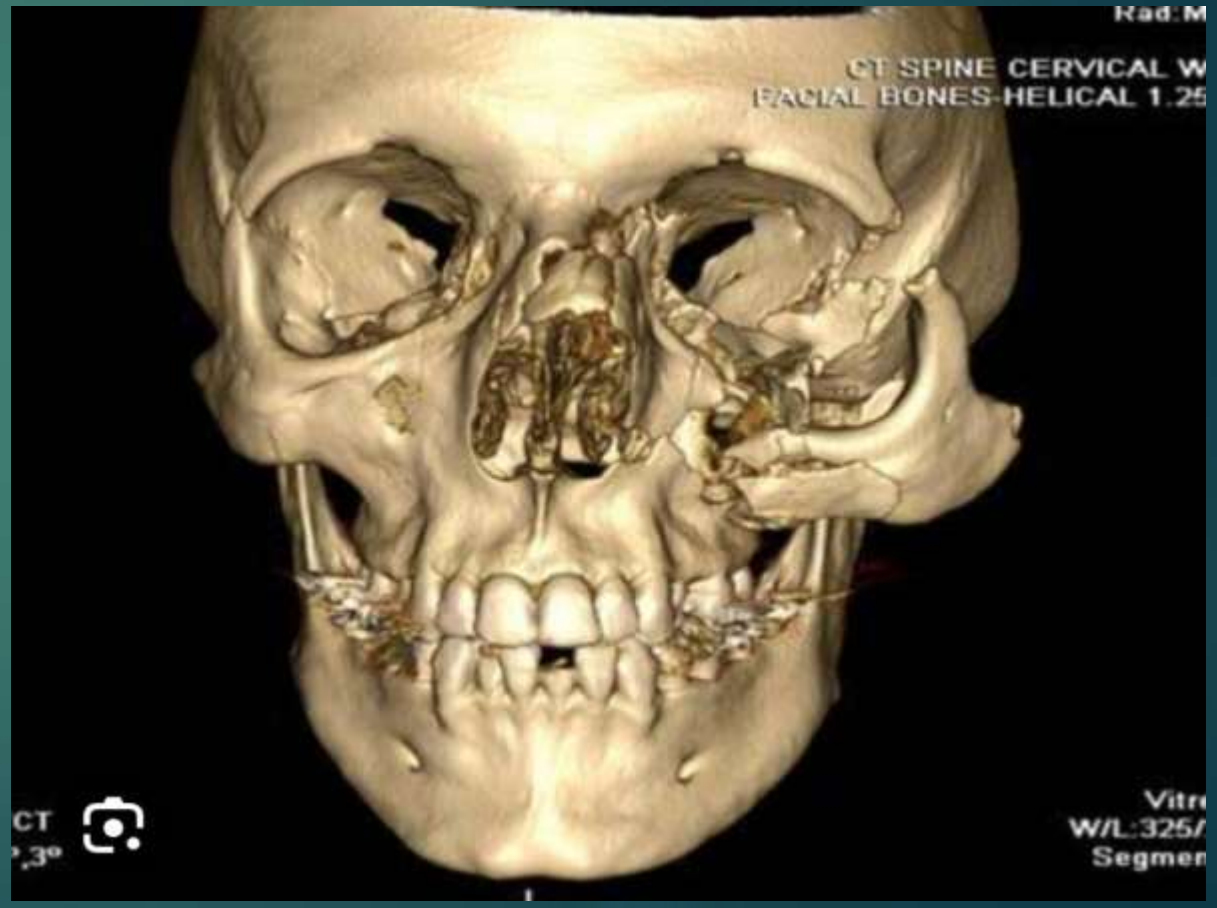
Radiographic examination

- PA waters view or occipitomental projection for ZMC fractures.
- Submentovertex or Jug handle view for zygomatic arch fractures.
- CT scan or 3D CT scans are the current norms.

PA Water's view and Submentovertex view

CT scan and CBCT image of ZMC fracture:





Management

- Management of ZMC fractures and arch fractures depend on degree of displacement and esthetic and functional problems following it.
- Goals of treatment:
- Correction of pupillary level
- Correction of diplopia
- Correction of enophthalmos
- Protection of the globe
- Eye muscles function restoration
- Facial contour restoration
- Infraorbital nerve entrapment to be taken care

Indications for surgery:

- Depressed arch
- Depressed malar eminence
- Diplopia
- Enophthalmos
- Paresthesia in V2 distribution
- Trismus
- Derranged occlusion

Operative techniques

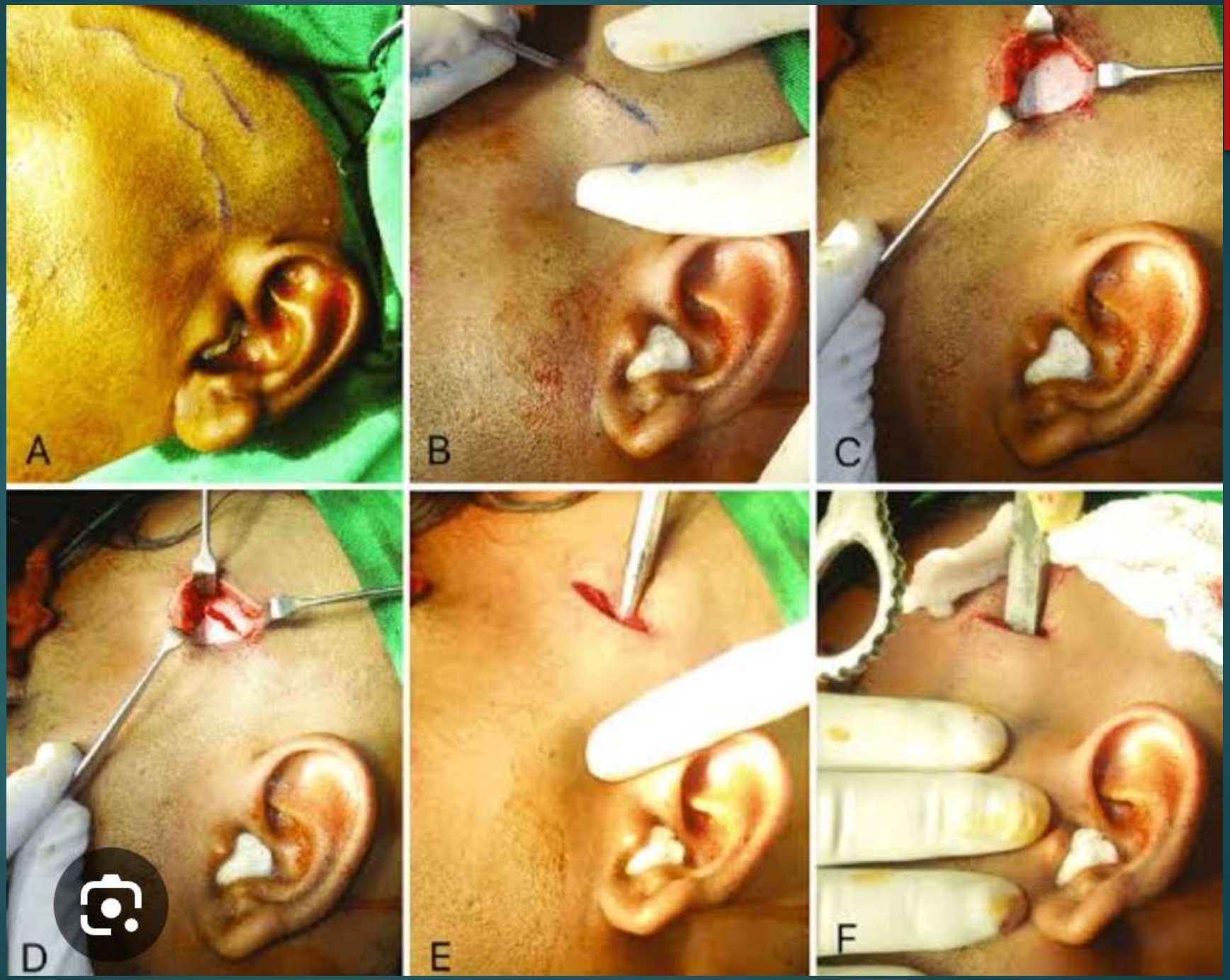
- ***Gillies Temporal approach (Gillies, Kilner, Stone)...(1927)***

- Temporal fascia is attached to zygomatic arch and temporal muscle passes downward medial to the fascia.
- Between these two structures instrument can be inserted and it can be utilized to elevate the displaced zygoma.

Technique:

- Hair is shaved from temporal region
- External auditory meatus is plugged with cotton to prevent any fluid or blood getting inside
- Incision about 2-2.5 cm in length is made inclined forward 45 degree to zygomatic arch.
- Temporal fascia is exposed
- Long ***Bristow's periosteal elevator*** is passed below the fascia and above the muscle

- Tip of the elevator is manipulated upward forward and outward
- Snap sound will be heard as soon as reduction procedure is complete.
- Care is taken that after surgery at least 5-7days no pressure is exerted on the area till the bone consolidates.
- Pt is instructed to sleep in supine position or not to sleep on the operated side


A
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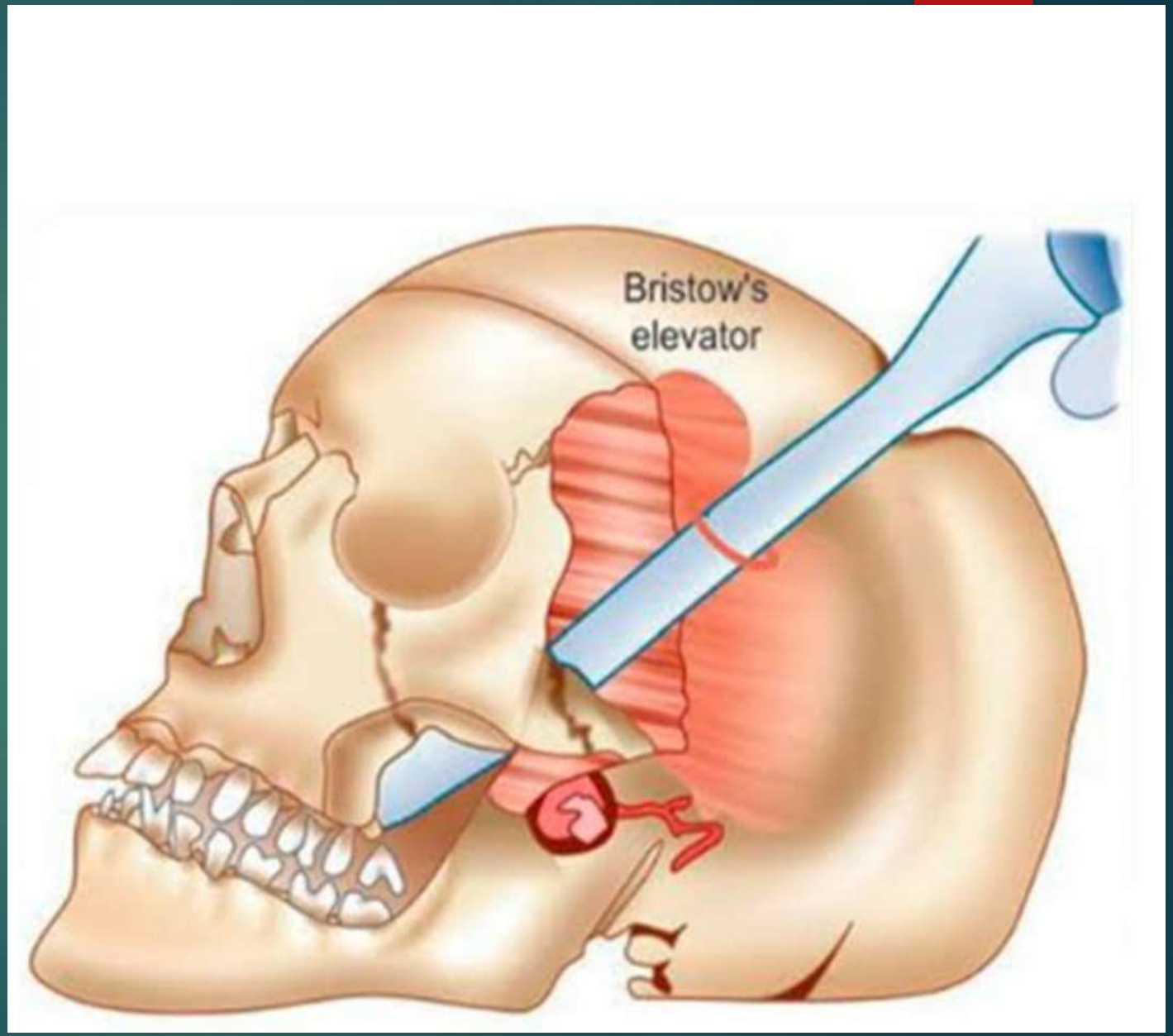
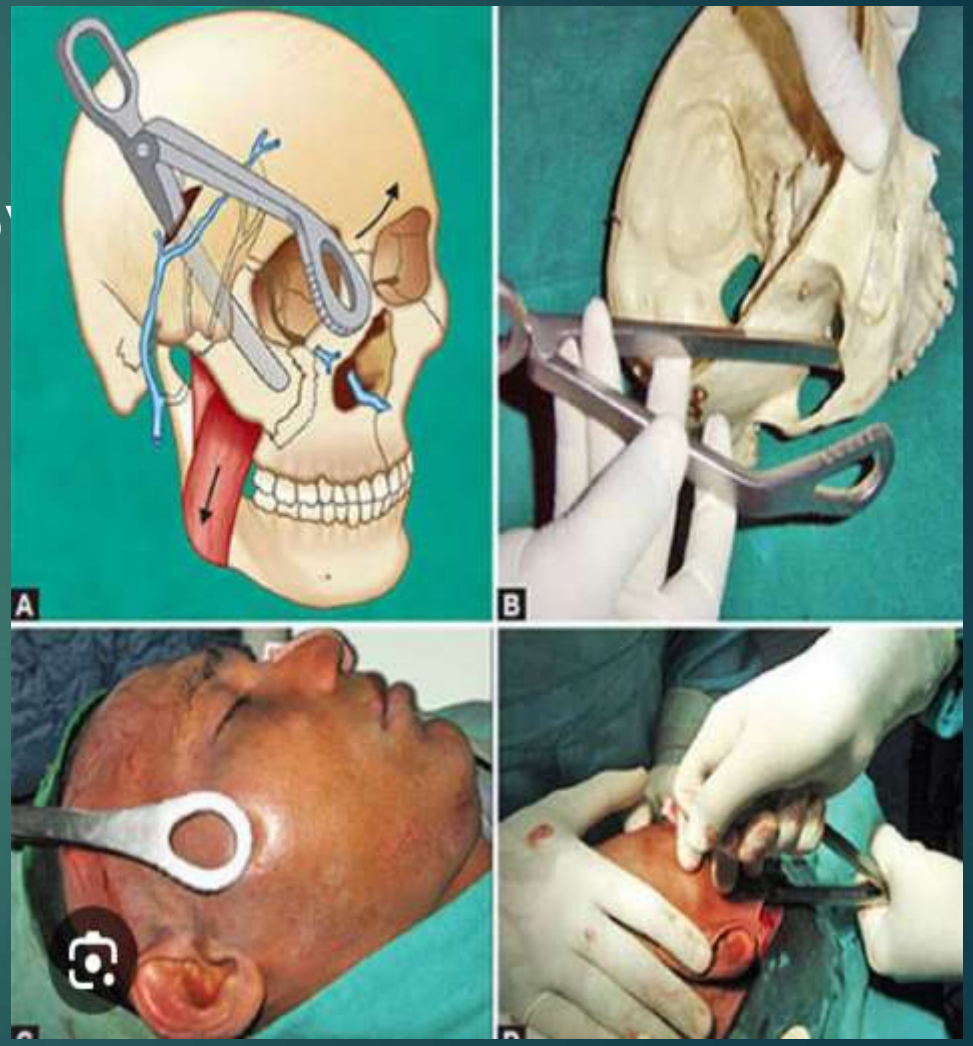
F


11mm

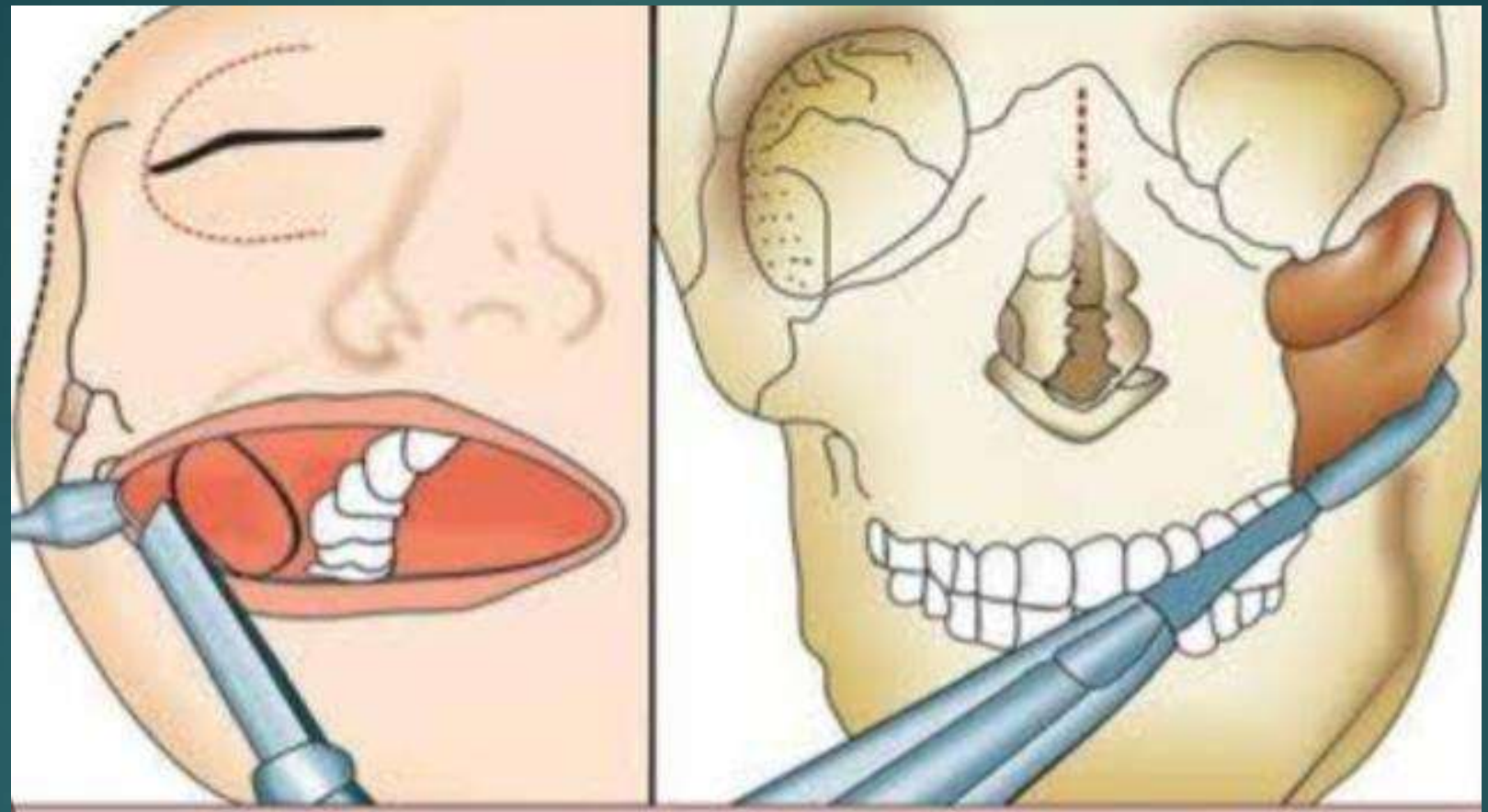

Bristow's
elevator

- Rowe's modification of Bristo



- ***Keen's Vestibular approach (1909):***

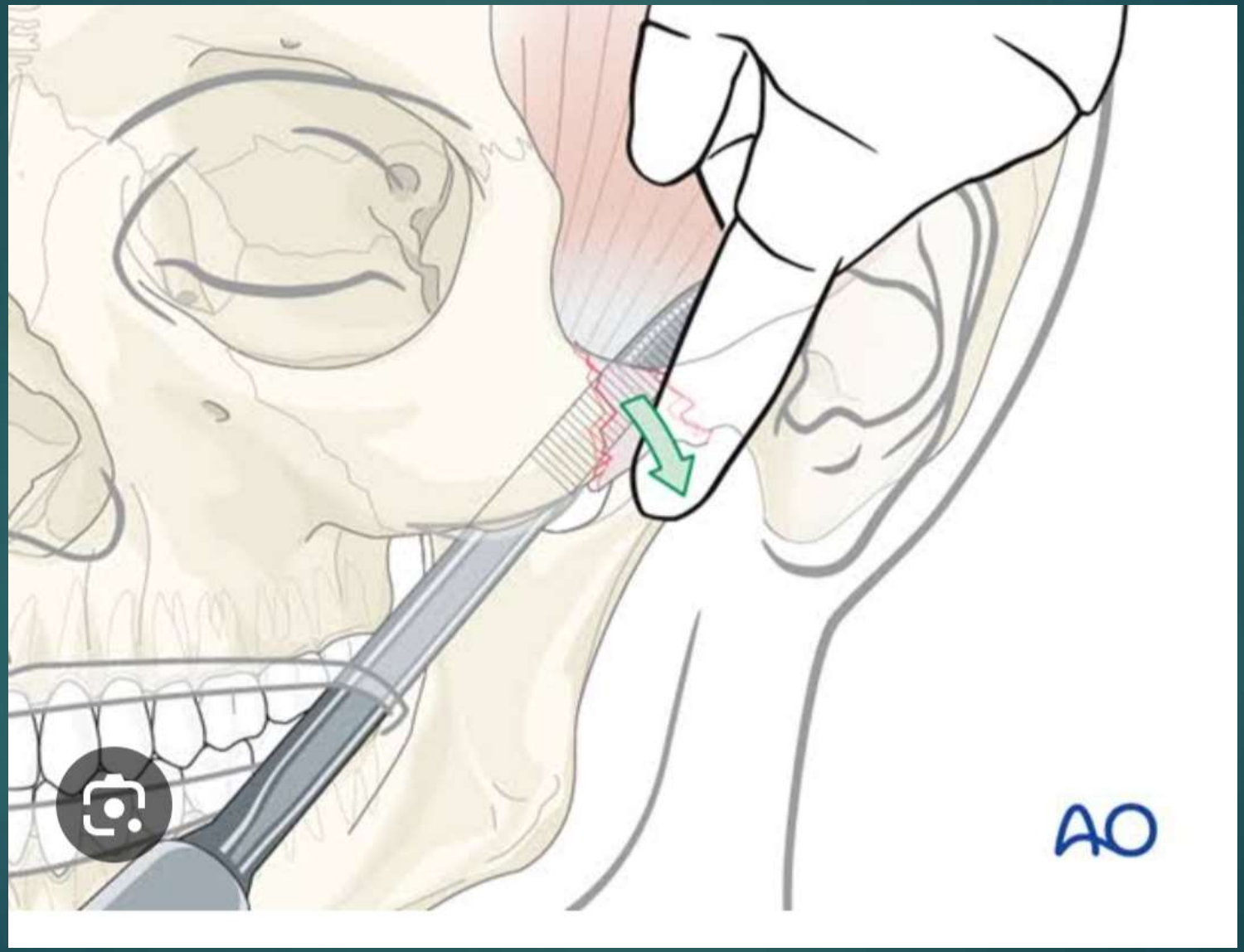
- Intraoral buccal vestibular incision is taken at 1st and 2nd molar region behind the zygomatic buttress
- A pointed curved elevator (Monk's pattern) is passed supraperiosteally up beneath the zygomatic bone
- The depressed bone is then elevated with an upward or superior, forward, outward movement.
- It avoids extra oral scar.



Intraoral Keen's approach for reduction of zygomatic bone/arch fracture

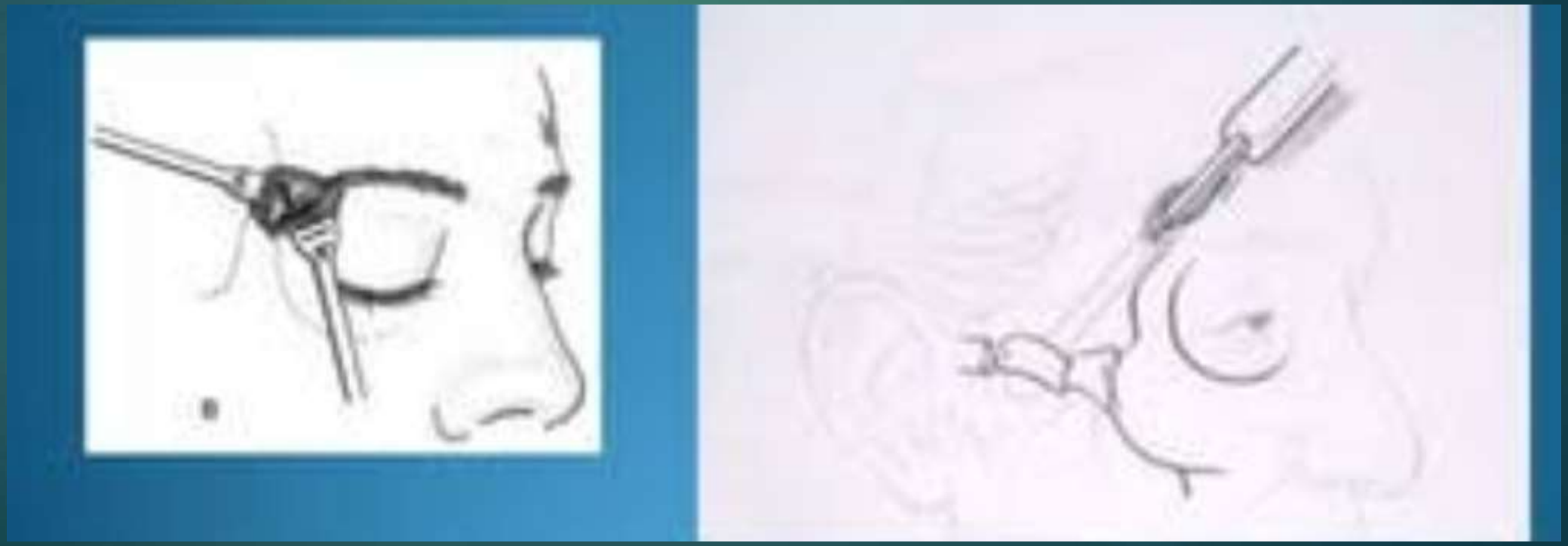
- ***Lateral coronoid approach- Quinn (1977)***

- For reduction of isolated zygomatic arch fracture.
- Intraoral incision is taken 3-4cm on the anterior border of ramus till the depth of the insertion of temporalis muscle.
- Instrument is passed between temporalis muscle and arch and reduction is done.

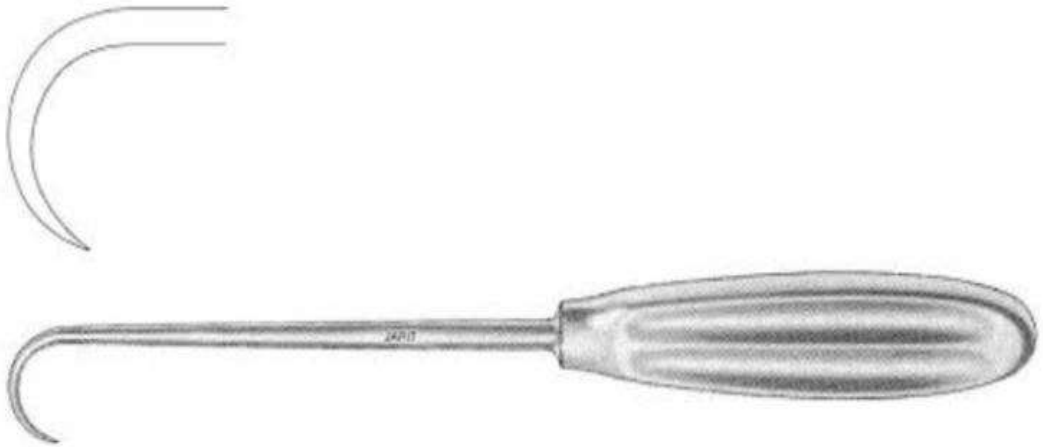

AO

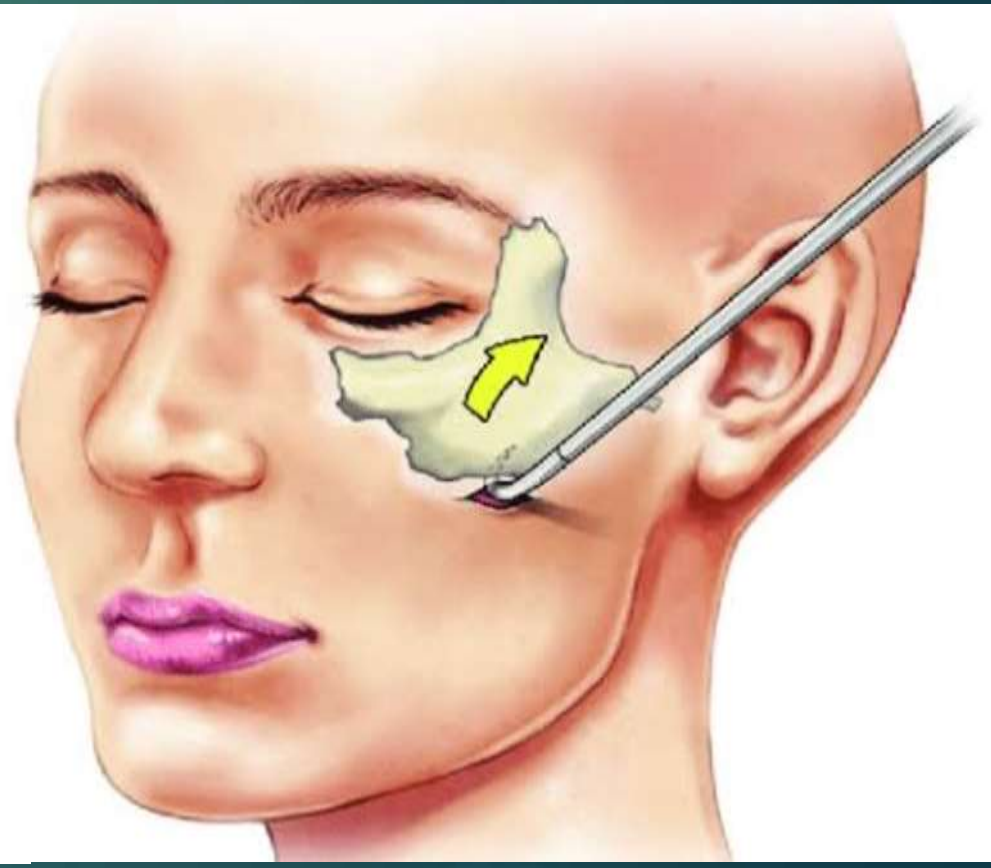
- ***Dingman's approach (through lateral canthal incision)***

Through the lateral canthal incision the Dingman's elevator is placed posteriorly to the body of the zygoma along the zygomatic arch and a reduction of zygoma is done

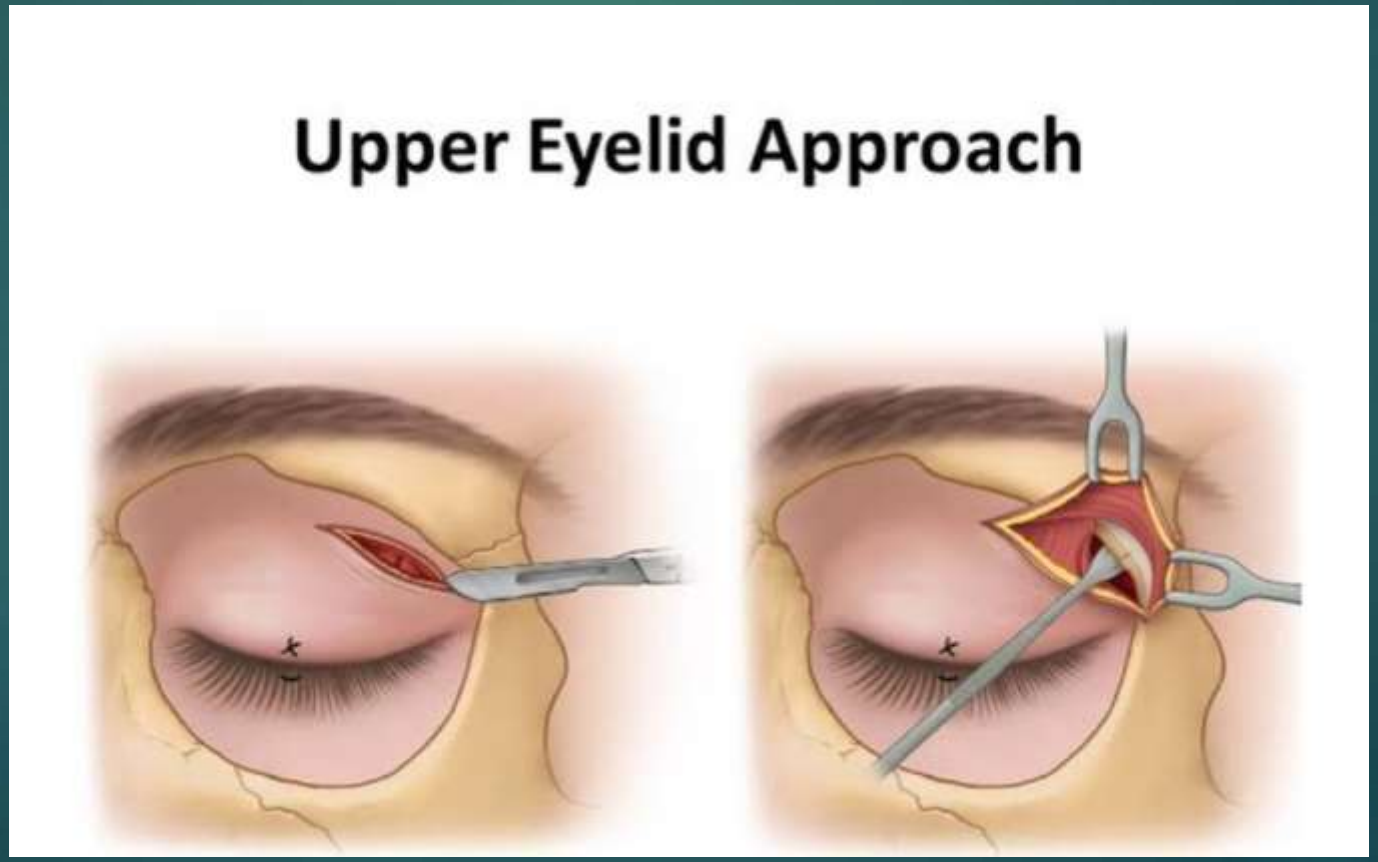


- ***Percutaneous reduction of zygomatic arch fractures by Zygoma hook:***





- ***Upper eyelid approach***



Eyebrow approach

- ***Lower eyelid Approach***
- -subciliary
- -subtarsal
- -midlid

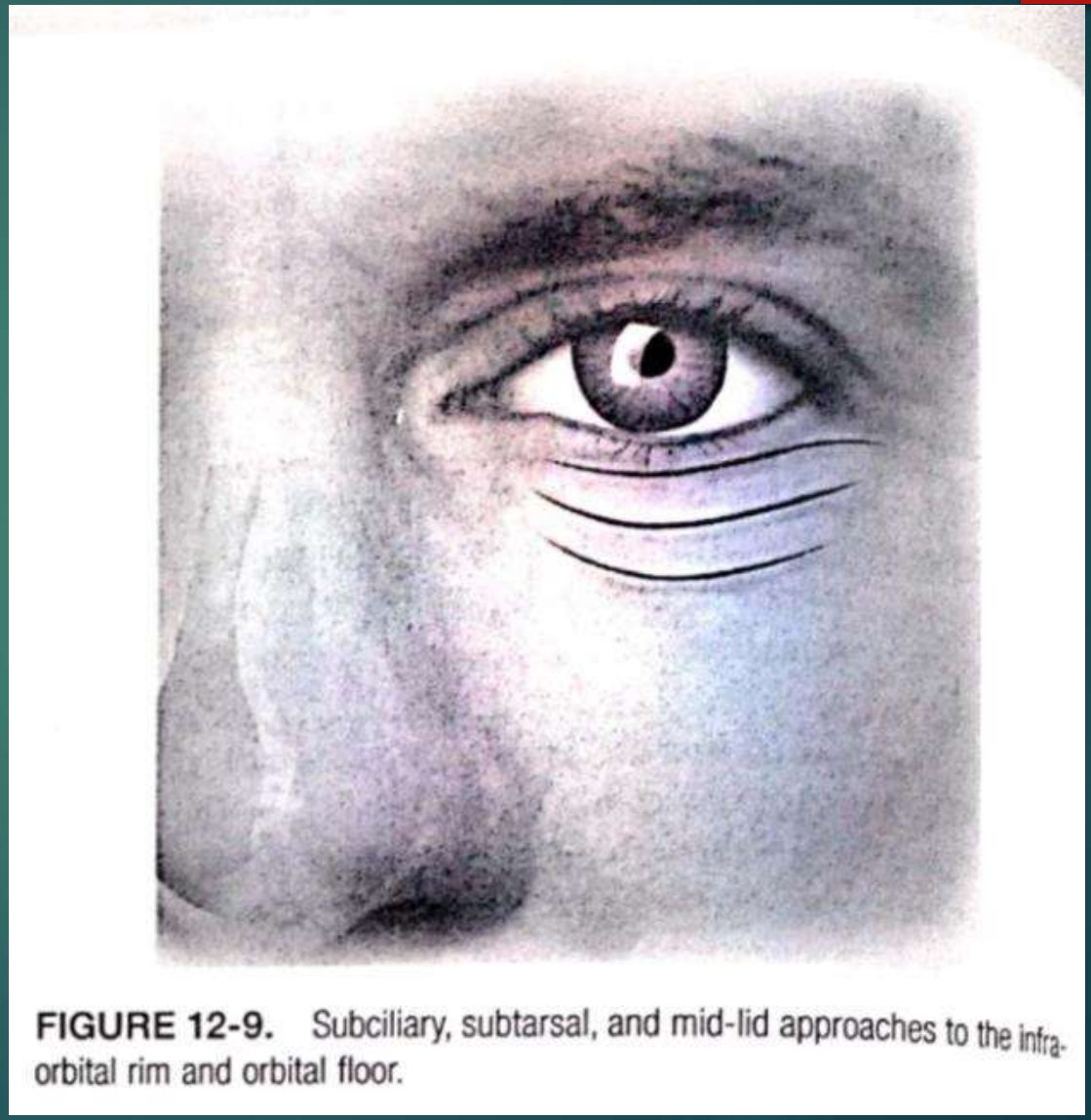
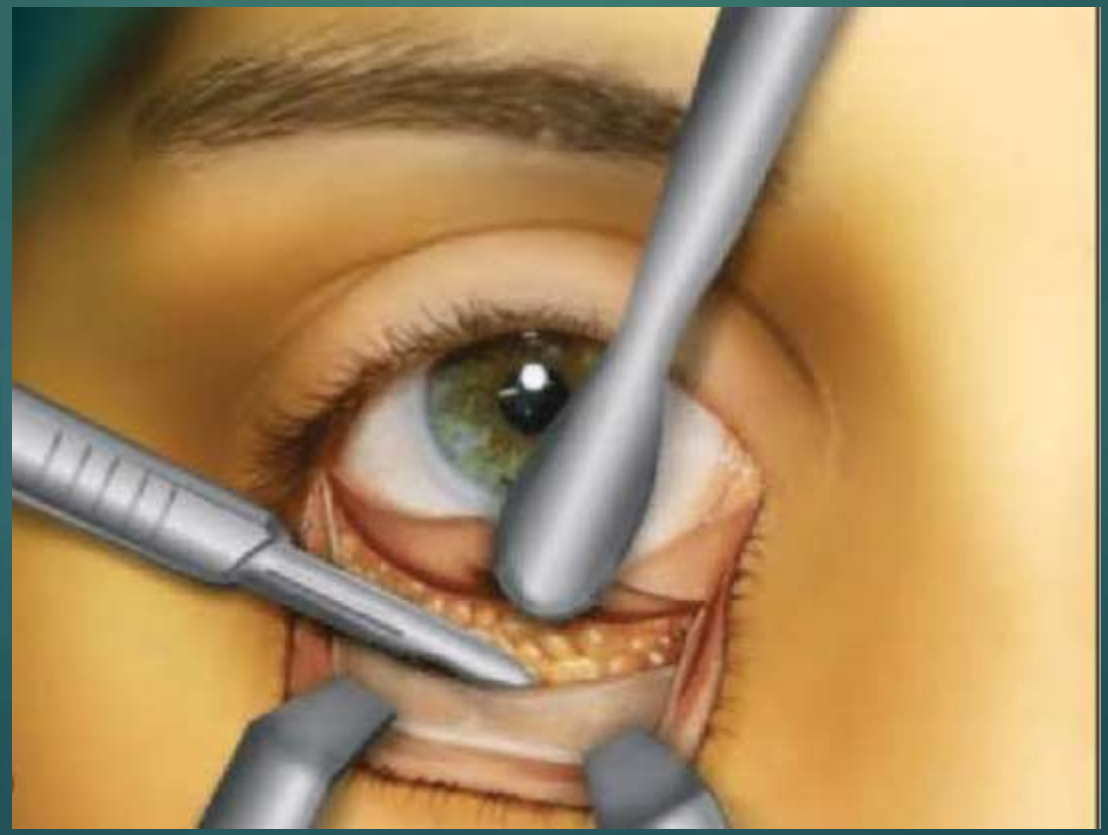
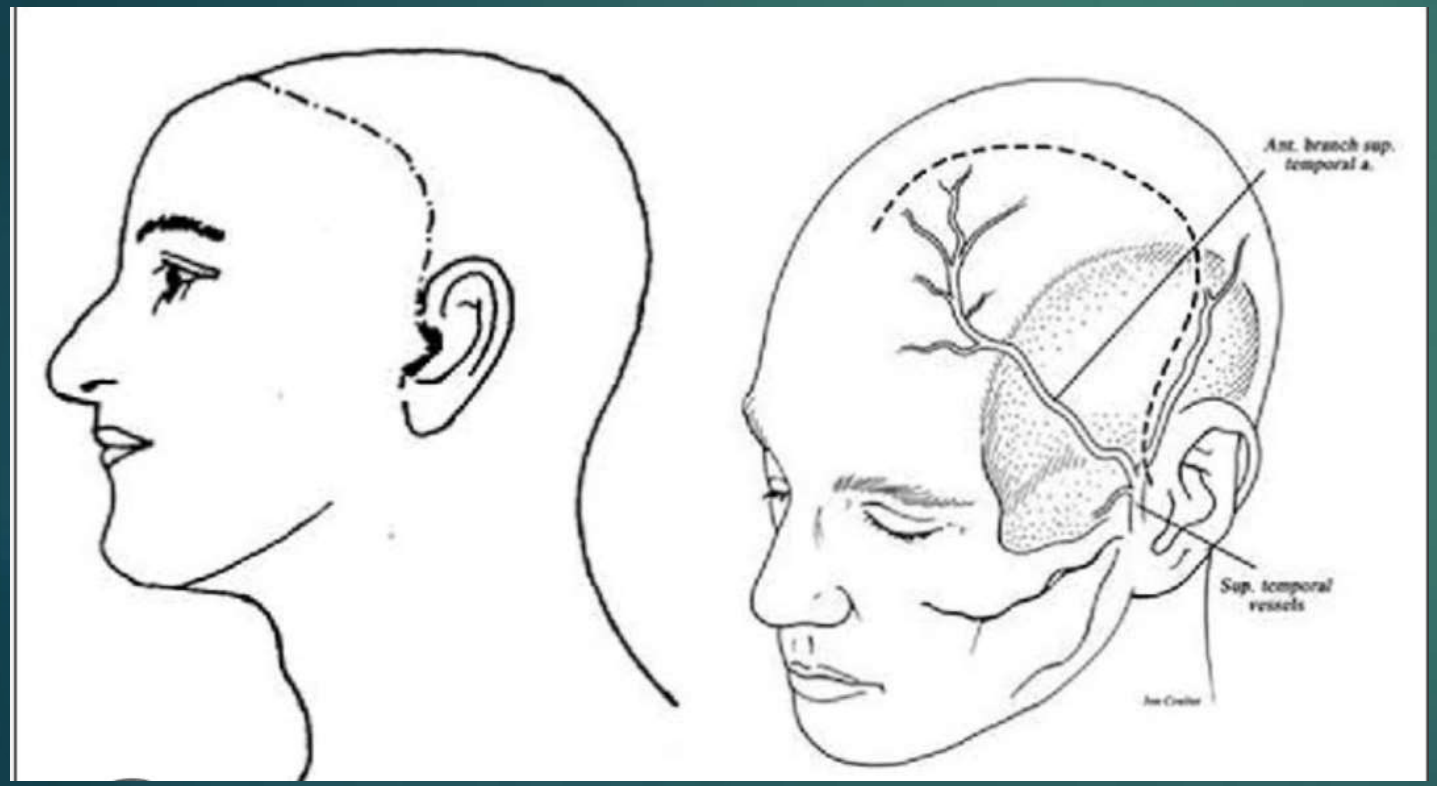


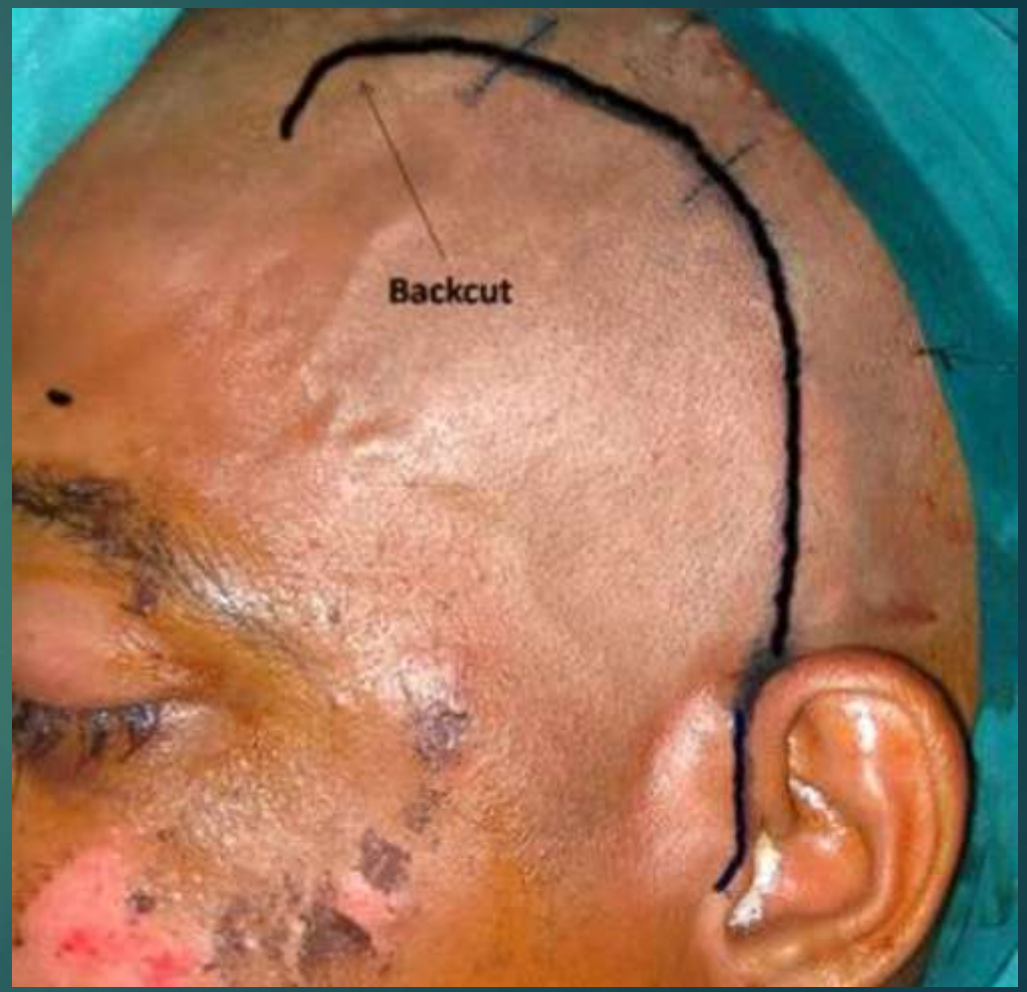
FIGURE 12-9. Subciliary, subtarsal, and mid-lid approaches to the infra-orbital rim and orbital floor.

- ***Transconjunctival approach***



- ***Hemicoronal approach***:



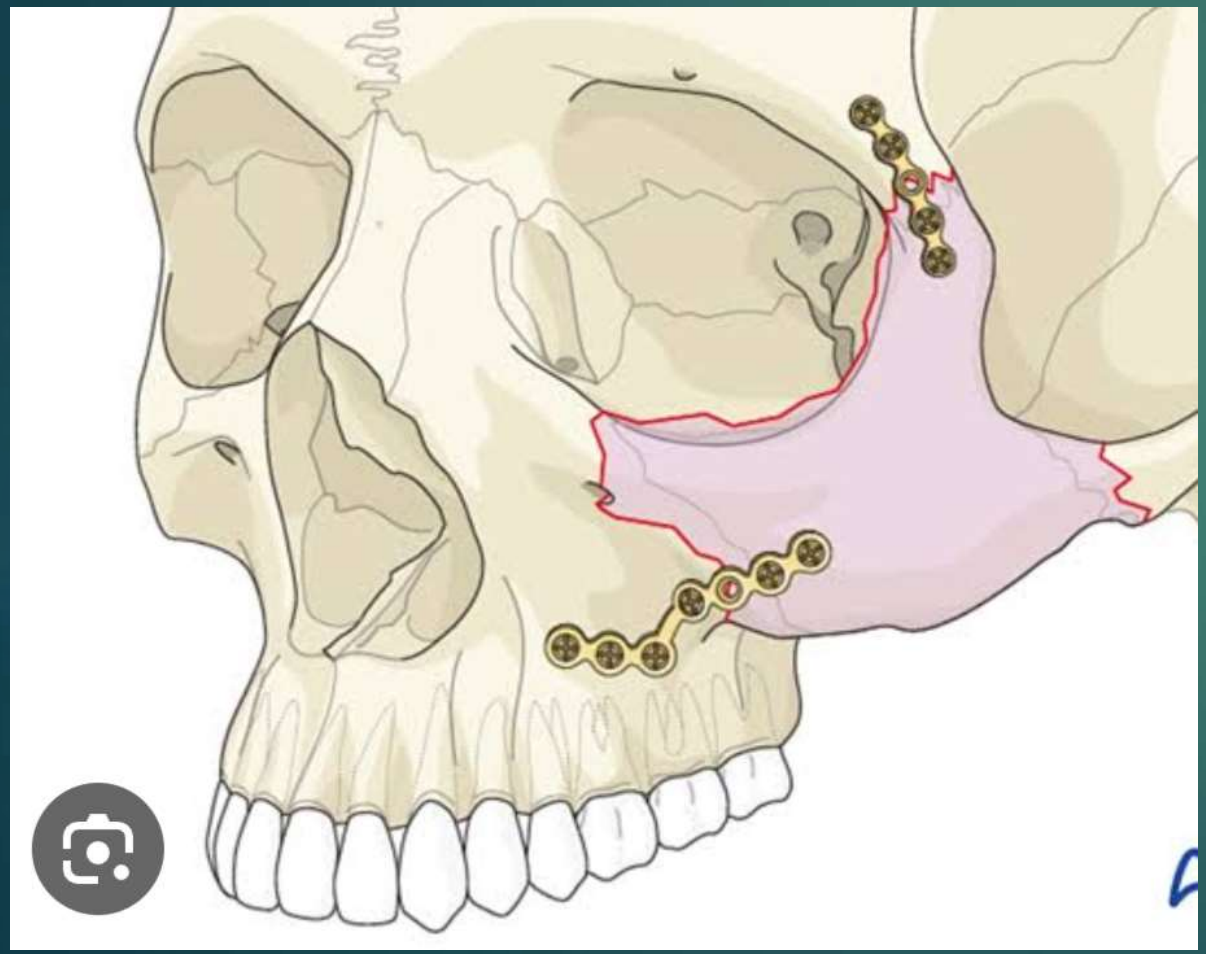


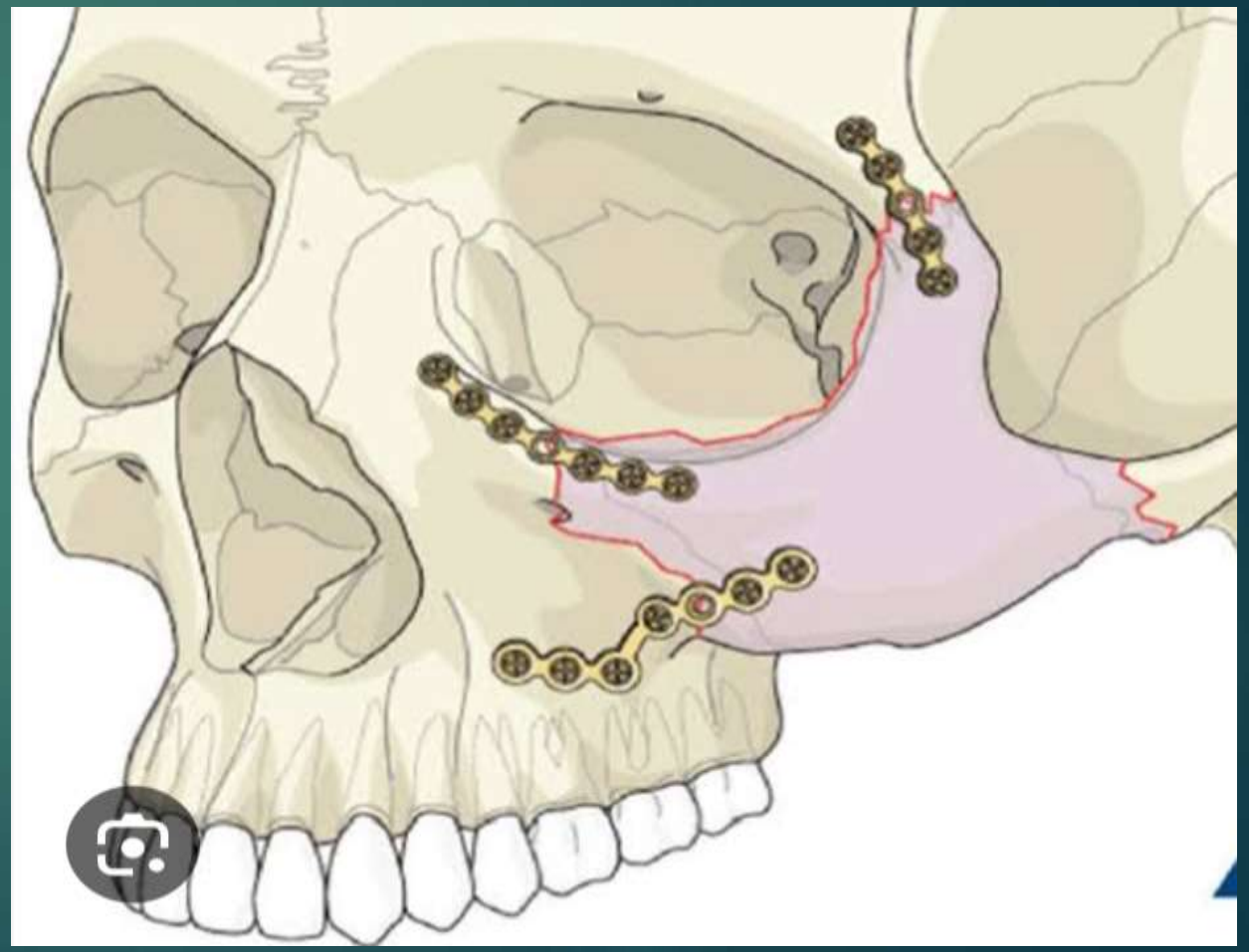
Fixation

- In case of unstalate and comminuted fractures there is need for fixation bone plating.

1. Fixation at Lateral orbital rim will help to restore vertical height.
2. Fixation at buttress of zygoma will give projection
3. Direct fixation at infraorbital rim and buttress will restore facial width and orbital volume.

- All 3 point fixation gives better stability in unstable fractures.
- Additional fragments will need separate fixation.





Complications of ZMC fractures:

- ***1. Infraorbital paresthesia***
- Due to injury to infraorbital nerve injury which may occur due to compression, edema, ischemia, laceration

- ***2. Soft tissue complications:***
- Eg. Dehiscence, hematoma or seroma, lymphedema and scarring., Vertical shortening of lower lid may occur when the scar contracts

- ***3. Persistent paresthesia***
- Binocular diplopia is common complication of zygoma fracture involving the orbit. This can be temporary or may become permanent if not treated
- Can be due to hematoma or edema or muscle entrapments.

- ***4. Traumatic optic neuropathy:***
- Rare but devastating cause of partial or complete loss of visual function

- ***5. Malunion of zygomatic fractures:***
- This results in cosmetic deformity from malposition of makar eminence as well as diplopia secondary to malposion of globe

- ***6. Late onset post traumatic enophthalmos***
- Enophthalmos is defined as recession of the globe within the orbit. Can result from absolute reduction of orbital tissue, relative reduction of tissue or both.
- Absolute reduction: scarring And atrophy of orbital soft tissue (such as fat)
- Relative reduction: bony displacement resulting in displacement of orbital soft tissue.
- Enophthalmos is treated by decreasing orbital volume with osteotomies, or increasing the volume of orbital tissue with bone grafts, cartilage grafts.

- ***7) Retrobulbar hemorrhage:***
- It is an ophthalmologic emergency resulting in intraocular pressure with ophthalmic artery compromise and loss of vision caused by retinal ischemia.

References

- *Oral and maxillofacial Surgery Fonseca volume 2*
- *Maxillofacial injuries N. L. Rowe and Williams*
- *Textbook of Oral and Maxillofacial Surgery Neelima Anil Malik 5th ed*

THANK YOU!